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STERL

STUDENT WORKBOOK

HUNTINGTON TWO COMPUTER PROJECT

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STUDENT MATERIAL

Ever since the publication of Rachel Carson's *SILENT SPRING* in 1962, there has been growing public concern about the effects of bombarding the environment with large amounts of pesticides in order to gain control over certain destructive or irritating species.

The greatest concern has been directed toward a particular group of organic pesticides, the *chlorinated hydrocarbons*, which include such compounds as DDT, dieldrin, aldrin, and chlordane. Because these compounds do not break down easily, they are effective for long periods of time and especially good as residual pesticides. But this stability also makes them dangerous; since these chemicals can become concentrated in dangerous amounts in the tissues of organisms that feed higher up on the particular food chains in question.

You are probably familiar with attempts to ban the use of certain pesticides. Many of these attempts are motivated by the conviction that using large amounts of pesticides is not only ineffective but dangerous to non-target species and generally harmful to the environment. How realistic are these fears? Just how effective are pesticides?* If these fears are well founded, or if certain pesticides become progressively less effective as a result of target species developing resistance to the chemical poisons, do we have alternative methods of control?

The Sterile Male Technique

One of the most promising innovations in the area of biological control (biological control refers to controlling a pest by means of its natural enemies) is the use of sterile males to control or eliminate an insect pest.

This idea was first proposed by Dr. Edward Knipling (today Science Adviser to the U. S. Department of Agriculture's Entomology Research Branch) over 30 years ago. Critics were highly skeptical of his idea at the time, but Dr. Knipling persisted in his research. His target was the screw-worm fly, a major insect enemy of livestock in the South. The female flies lay their eggs in the open wounds of animals, and when the larvae hatch they feed themselves on the flesh of the animal host; this can kill even a full-grown animal in a matter of days.

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* Your teacher should be able to direct you to background readings on the controversy over pesticides.

Fortunately for the livestock industry (and for all of us), Dr. Knipling's initial attempts to control the screw-worm fly were highly successful. In January of 1958 sterile fly releases were started in Florida and parts of Georgia and Alabama. By February of the following year, it appeared that the screw-worm fly had been eliminated from the southeastern United States.

Due to Dr. Knipling's lead, research is in progress to develop and perfect the sterile male technique for many other target species. There is also a growing movement toward *integrated control*, the use of a combination of methods in a coordinated pest control program.

The *STERL* Program

In the *STERL* program you will have the opportunity to explore the effectiveness of both pesticides and the sterile male technique. You can use the two methods singly or in any combination that you prefer. Your goal is to eliminate the screw-worm fly population in your 10,000 square mile area. In doing so, you might keep in mind not only program costs and cost of damage, but environmental considerations as well. The program will chart your progress over a 75-day period.

INSTRUCTIONS

STERL proceeds by asking for the following inputs:

```
PESTICIDE (1=YES, 0=NO)?  1

WHICH DAYS

? ____
.  .
.  .
.  .
.  .
.  .
.  .
.  .
?  0
```

If you type in "1" for yes, the program will ask for the days on which you want pesticides used. (Type "9" if you want pesticides on Day 9, etc.) Any number of days, up to 75 days, is acceptable. Be sure to type only *one* number on each line after the question mark. When you have typed in all the day numbers, use a "0" to indicate that you are done.

STERILE FLIES (1=YES, 0=NO)? 1

HOW OFTEN (1=DAILY, 2=SELECTED DAYS)? 1

HOW MANY PER DAY? ________

FROM WHEN, TO WHEN? _____, _____

If you type "1" for yes, the program will ask if you want to use sterile flies daily or only on selected days. If you want to use flies daily, input the number of sterile flies (up to 1 million) and the first and last days of the period for which you want flies released. *(Be sure to separate the two days with a comma.)*

IF YOU HAD REPLIED "2" TO THE ABOVE SECOND QUESTION (SELECTED DAYS), THEN YOU WOULD HAVE THE FOLLOWING RESPONSE:

HOW OFTEN (1=DAILY, 2=SELECTED DAYS)? 2

DAY, NUMBER OF FLIES
? _____,_____
. . .
. . .
. . .
. . .
? 0 , 0

If you decide to release sterile flies only on selected days, or want to vary the number of flies to be released each day, you will have to type in each day number as well as the number of flies (up to 1 million) for that day. Again be sure to type only the data for *one* day on each line, and finish by typing in "0,0".

OUTPUT: The computer will print a graph of the number of normal adult male flies* in the area over a 75-day period. Because the computer graph is not highly accurate (e.g., if the number of flies is less than 10,000, its plot will be 0), the actual number of flies will be printed next to the appropriate point.

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*There are an equal number of adult female flies in the area, and it is merely a matter of convention to specify the population by the number of male flies.

Toward an Effective Control Program

By trying different measures and comparing the results, you can determine the effectiveness of different pest control programs. But there are many possibilities: the use of pesticides alone; the use of sterile males alone; releasing different numbers of flies; using pesticides as well as sterile fly releases at the same time, at different times, or for different periods of time, etc. To cut down the number of runs you will have to make in order to gather sufficient data for comparing and drawing conclusions, try to map out your runs ahead of time in some orderly way. A *SAMPLE RECORD SHEET* has been provided in case you want to keep a separate record of your runs.

STERL

SAMPLE RECORD SHEET

	PESTICIDE	STERILE-FLY RELEASES					
		Daily			Selected Days		
RUN NO.	DAY____TO____	DAY___	TO___	NO.______	DAY_____	NO.____	RESULTS